



# Superfund At Work

## Hazardous Waste Cleanup Efforts Nationwide

### Arsenic Trioxide Site Profile

**Site Description:**

Three arsenic-contaminated counties in southeastern North Dakota

**Site size:** 568 square miles

**Primary Contaminants:**

Arsenic, iron, and manganese

**Potential Range of Health Effects:**

Acute toxicity to peripheral and central nervous system in all species

**Nearby Population:** 4,500 people

**Ecological Concerns:**

Contaminated glacial aquifers; poisoning of birds, mammals and beneficial insects

**Year Listed on NPL:** 1983

**EPA Region:** 8

**State:** North Dakota

**Congressional District:** 8

### *Success in Brief*

## Pesticide Taints Ground Water in North Dakota

When grasshoppers swarmed and wreaked economic havoc on crops during the Great Depression of the 1930s, farmers used an arsenic pesticide to repel them. These were miserable, desperate times of massive unemployment and breadlines complicated by a major drought in "Dust Bowl" states. Tons of the arsenic bait controlled the grasshoppers, but in the process, contaminated top soil and the major ground water reserves for three counties.

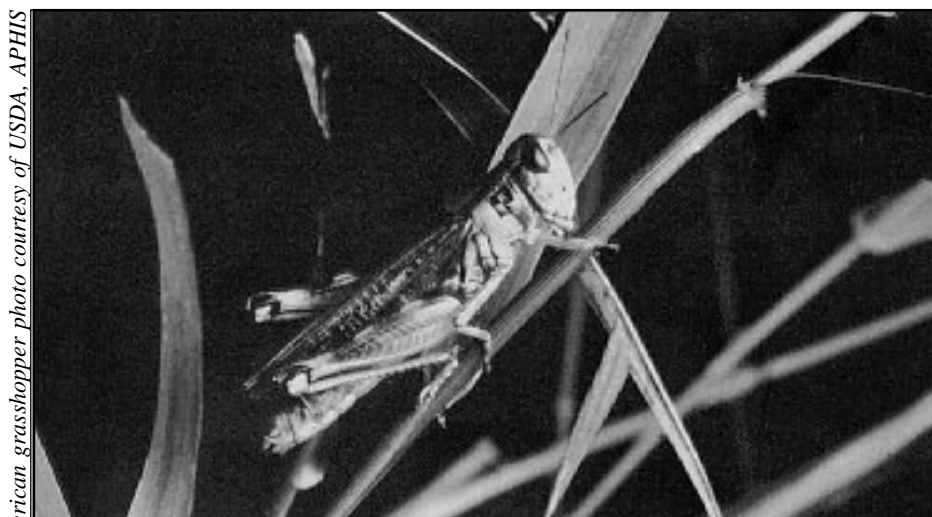
Almost 40 years later, the U.S. Environmental Protection Agency (EPA) used the Superfund program to provide safe drinking water to small town and rural residents. Working with state health authorities, regional and local water districts, and American Indian tribes, EPA provided \$7.8 million in financial assistance to:

- Expand a series of treatment plants and construct storage reservoirs and supply wells;
- Install more than 300 miles of pipeline to connect residences to treated water systems; and
- Identify and preserve archaeological sites during construction.

Along the way, state and federal officials conducted a comprehensive community relations program to inform citizens about the pesticide, provide bottled drinking water, and enlist local support in resolving issues.

## The Site Today

All construction activities have been completed. Operation and maintenance of the Richland Rural Water Treatment Plant and distribution system as well as the modified Lidgerwood and Wyndmere treatment plants have been assumed by North Dakota officials. EPA is conducting water quality monitoring and will perform five-year reviews to determine if safe drinking water standards continue to be met. The first review is scheduled for August 1994.



American grasshopper photo courtesy of USDA, APHIS

**Tons of arsenic bait** controlled grasshoppers in the 1930's but contaminated drinking water and topsoil.

## A Site Snapshot

The Arsenic Trioxide Superfund site encompasses 568 square miles of southeastern North Dakota and includes 20 townships in three counties. Approximately 4,500 people live throughout this primarily agricultural area which includes the small towns of Lidgerwood, Wyndmere, and Milnor.

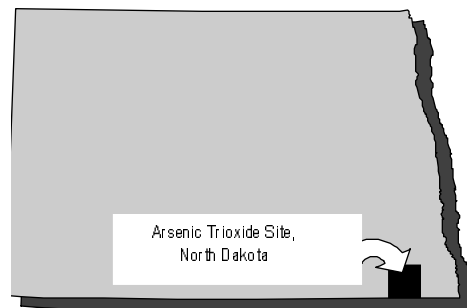
During routine water quality monitoring in 1979, elevated levels of arsenic, iron, and manganese were detected in Lidgerwood and Wyndmere water supplies and in more than 100 private wells. Studies in 1985 by EPA and the North Dakota State Department of

Health identified the source as arsenic-laced bait widely used until the early 1940s to combat grasshopper infestations of grain crops.

An estimated 330,000 pounds of the pesticide bait were used during this period, contaminating

thousands of acres of topsoil and seven major glacially formed aquifers. Drinking water for towns and rural areas had to be treated, with 300 miles of new waterline hook-ups provided to 278 affected residences.

Arsenic is acutely toxic to the central nervous system, and when spread through a wheat bran bait, poisons birds, mammals, and other beneficial insects. Advances in science and land management have lead to much different techniques today to control pest populations below levels that cause economic damage.



## Arsenic Trioxide Site Timeline

• Site added to National Priorities List

• North Dakota studies site  
• Water testing begins in homes  
• Public meetings held

• Congress enacts Superfund

• Arsenic detected in Lidgerwood and Windmere municipal water supplies  
• Lidgerwood begins construction of new treatment plant

• Safe Drinking Water Act passed

Arsenic-laced bait controls grasshoppers



# Desperate Times Dictate Overuse of Pesticide

## Economic Depression and Drought at Crisis Levels

Low retail sales, mass unemployment, and a high rate of business failures marked the period of economic slump known as the Great Depression. From 1929 to 1932, farm prices fell by 53% when more crops were produced than could be sold profitably.

A major drought in the ensuing years eliminated surpluses but also destroyed crops and turned topsoil to dust in five Great Plains states (southeastern Colorado, southwestern Kansas, the panhandles of Texas and Oklahoma, and northeastern New Mexico). Farmers had been plowing up millions of acres of grassland for winter wheat to

feed livestock; many more acres were overgrazed.

With an average annual rainfall of less than 20 inches, winds blew over dry, bare fields, piling topsoil into dunes, some 30 feet high, blanketing houses, barns and fence posts. Lighter silt accumulated in dust clouds as high as five miles, forming "black blizzards" that swept from the Midwest all the way to the Atlantic coast.

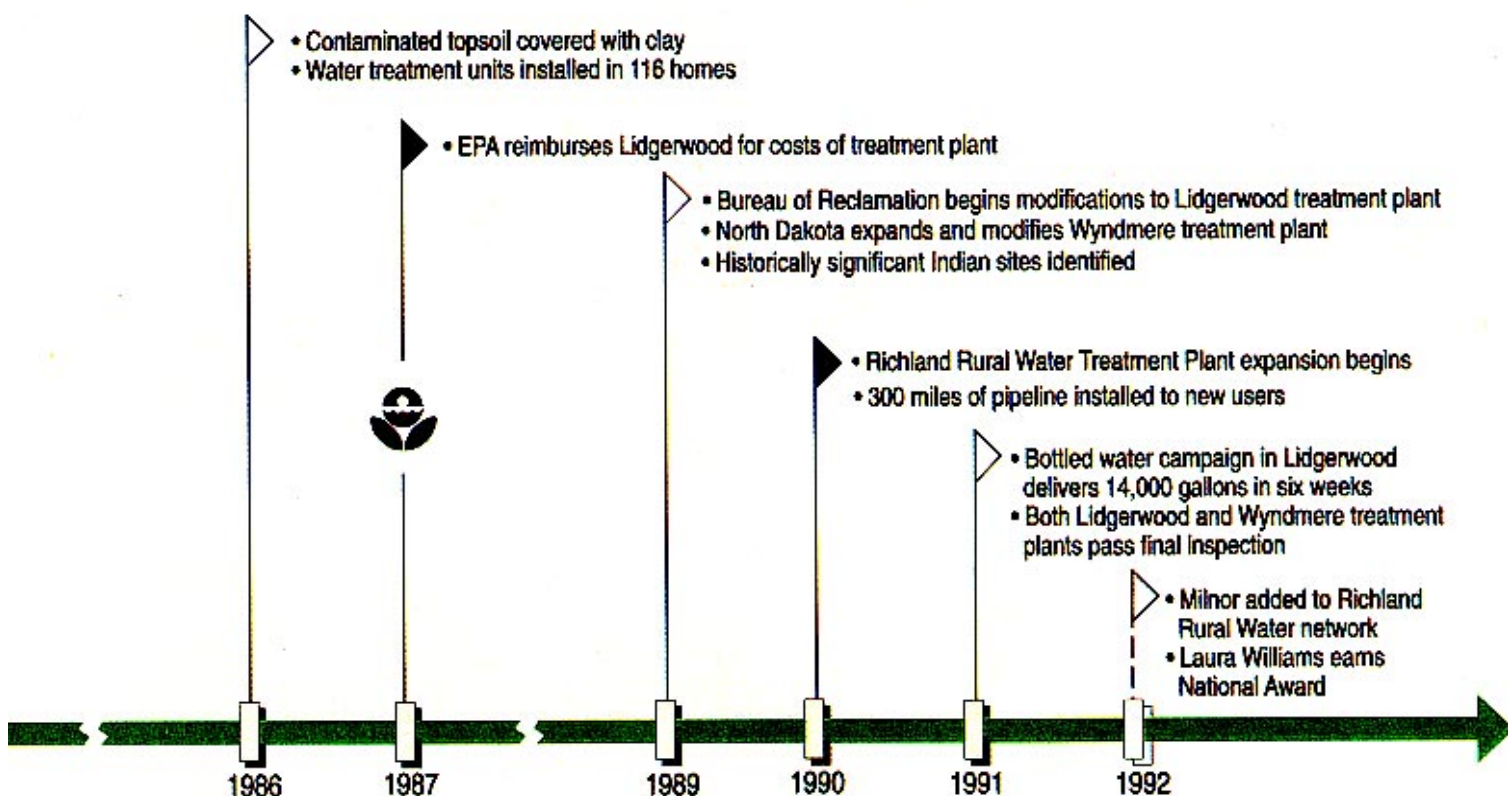
Every wild animal felt the pressures of large-scale wind erosion, including grasshoppers. Under stress, swarms of these insects left the denuded Dust Bowl states and descended on North Dakota farmers, gobbling up grains intended for forage. In response, the U.S. Department of Agriculture distributed through

state and county extension agents tons of arsenic bait to poison the grasshoppers.

## New Superfund Law Provides Assistance

Residues of arsenic seeped into ground water, in turn contaminating drinking supplies in Richland, Ransom, and Sargent Counties. More than 35 years would go by before North Dakota health officials identified arsenic in the Lidgerwood municipal system in 1979. State officials initiated remedial action but turned to EPA for help after announcement of a new law in 1980.

Congress had enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) that year,





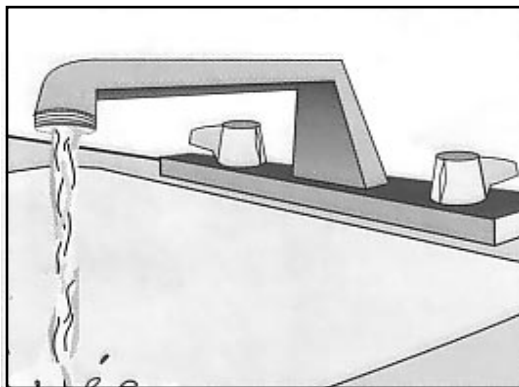
establishing a nationwide Superfund program to address hazardous substances, pollutants, or contaminants that endanger the environment.

In 1982, the Arsenic Trioxide site was proposed for addition to the National Priorities List, EPA's roster of sites eligible for cleanup under the Superfund program. North Dakota officials received a Cooperative Agreement to investigate the full extent of the contamination. In addition to the pesticide bait, naturally occurring arsenic shale deposits were found to contribute to the unacceptably high concentrations in ground water.

### Remedy Fits Rural Setting

During their investigations, state officials covered with clay more than 10,000 square feet of . Contaminated soil in fields to prevent runoff from reaching wells and springs. In 1986, state officials installed individual water treatment units in 116 private homes and connected five residences to a rural water supply. But inclusion of this large rural area in the Superfund program required a comprehensive approach to resolving the ground water contamination. Classical treatment was technically not feasible because of the characteristics of the underground aquifers, the large affected area, and the lack of a single source.

EPA soon settled on a remedy geared to the area's rural nature: providing household water to residences that once relied on private wells using a central distribution system. Expansion of the Richland Rural Water Treatment Plant in Mantador, North Dakota and the associated distribution network began in July 1990 under another Cooperative Agreement with the state. Engineers installed more than 300 miles of pipeline to reach new users, constructed seven additional water storage reservoirs, drilled three new water supply wells, and approximately doubled the treatment capacity.



Monitoring later identified arsenic-contaminated ground water near Milnor, which was added to the Richland Rural Water Treatment Plant expansion. During the summer of 1992, engineers constructed a 135,000 gallon, potable water (suitable for drinking) reservoir and a distribu-

tion system with approximately 300 service connections and pipelines. State officials completed final testing of Milnor's distribution system in November.

### Superfund Covers Costs

To comply with Safe Drinking Water Act standards, Lidgerwood had begun construction of a new water treatment plant in 1979 which was completed in 1986. EPA reimbursed Lidgerwood for the costs after a 1987 EPA feasibility study confirmed that the plant appropriately treated the arsenic.

Within the first six months of operation, the plant was unable to consistently produce visibly clear water, and so Lidgerwood again asked EPA for assistance in making necessary plant improvements. Under an agreement with the U.S. Department of Interior's Bureau of Reclamation, modifications to the plant began in August, 1989. A "thumbs up" evaluation was, completed in January, 1991. At the same time,

Wyndmere's existing treatment plant was effectively removing the arsenic but needed a much larger storage capacity. Under a cooperative agreement with the state, engineers constructed a 50,000-gallon, potable water storage reservoir with a separate post chlorination system. This plant also passed final inspection in January, 1991.

## Community Relations Plays Important Role

Many families in the area expressed concern about the risks associated with arsenic contamination. EPA and North Dakota health officials cooperated on an extensive community relations program. Several public meetings were held, the first in 1982 in Lidgerwood, and again later that year and in 1983 as water testing was under way.

Frequent status reports were issued to area news media announcing informal meetings, locating information

centers, describing the remedy selection process, and summarizing progress. A pamphlet on arsenic sampling was distributed widely and questionnaires distributed to measure concerns and preferences. In Wyndmere, a door-to-door survey in 1986 solicited comments on the proposed treatment plant expansion.

When an intermediate tap water treatment system in Lidgerwood was required to be bypassed, EPA organized a bottled water program that lasted six weeks. Schools, businesses,

and community groups received nearly 14,000 gallons of bottled water, some delivered by the local Boy Scout troop. EPA later began a conscientious recycling program for empty bottles.

### Historic Sites Safeguarded

Throughout the project, EPA was alert to the possibility of uncovering archaeological sites. Construction specifications required visual inspection of any digging that took place, including installation of the 300 miles of pipeline. Every mile was walked and a 20-to-30-foot-wide survey conducted on each side of proposed pipelines.

Several sites classified as Prehistoric, Historic, or Prehistoric-Isolated were located throughout the area and reported to the state's historic preservation society. One was considered of major importance on the Sisseton-Wahpeton Sioux Indian Reservation where 18 miles of pipeline would run. Because of the site's significance, EPA altered the pipeline route. The tribes held a prayer ritual on September 27, 1989 to honor its location.



**Remedial Project Manager, Laura Williams**, shown here with former EPA Administrator William K. Reilly, won the national RPM of the Year Award in 1992 for her involvement and leadership in the community.

## What is Integrated Pest Management?

Grasshoppers are a large family of insects found in meadows, fields, and tropical regions around the world and are a vital part of the food chain in grassland ecosystems. Typically brown or green, common U.S. species are one to three inches long. Only five

species account for 90 percent of the total damage to cultivated crops including grain, flax, cotton, corn silk, alfalfa, and sweet clover. By contrast, 25 species have had injurious effects on rangelands.

Inspired by economic losses incurred by ranchers and farmers,

scientists have begun using new concepts to control pest populations called Integrated Pest Management. IPM uses a combination of biological, cultural and genetic control methods, with use of pesticides as the last resort. Traditional

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Photo courtesy of USDA, APHIS



**Collecting grasshoppers from the field** for IPM research.

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pesticide application poisons unrelated species and beneficial insects in the ecosystem and contaminates soil and ground water.

Scientists are now using an integrated approach to help predict when environmental conditions are conducive to grasshopper population explosions, which tend to occur every seven to 10 years.

The Animal and Plant Health Inspection Service (APHIS) of the U.S. Department of Agriculture has been studying grasshopper life stages, plant species, and range conditions to identify and evaluate control options. Research includes formulation of selective bran baits with low toxicity to other species, testing of pathogens for biological control, and ways to improve rangeland management.

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## Success In North Dakota

EPA's involvement in cleaning up the North Dakota Arsenic Trioxide site included financing a system for distributing water over a large rural area. State and federal officials cooperated to greatly expand existing distribution systems and treatment plants, construct additional water storage reservoirs, and drill new water supply wells. During the process, the Superfund site manager and community relations coordinators provided bottled drinking water, sought citizen reviews, and safeguarded historically significant Indian burial grounds.

Although grasshoppers continue to plague farmers, scientists are beginning to understand the unique characteristics of this insect and why swarming and overpopulation occurs. Integrated Pest Management techniques to manage, rather than eradicate designated pests, will shape the way farmers across the country grow and harvest crops in the future.



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